

January 30, 2006

TO: Air Emissions Reporting Facilities

FROM: David Wright, Chief  
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SUBJ: Guidance on Selecting Emission Factors to Estimate HAP Combustion Emissions

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**Introduction:** There are several methods for estimating the emission of hazardous air pollutants (HAPs) from the burning of fuel in industrial boilers. The most accurate estimate is derived from Continuous Emission Monitoring Systems (CEMS). The next best approach is to develop a facility-specific, annual average emission factor based on representative stack tests. This emission factor is then multiplied by the amount of fuel that the facility burned during the year. However, due to the cost of the above two methods, facilities usually use an emission factor developed for a similar facility. This memo provides guidance to facilities in their selection of an emission factor for combustion HAPs. The “backfilling” section also contains links to spreadsheets that estimate the amount of wood, distillate, or residual fuel that a facility will need to burn before it is likely to be required to report HAPs.

**Emission Estimation Hierarchy:** Emission estimation techniques are discussed in 06-096 CMR Chapter 137, section 4.G. Subsection (1) states:

“Air emissions reported to the Department pursuant to this Chapter shall be quantified/estimated in the manner which most accurately reflects actual emissions, as follows below. The Department retains the right to review reports, question the emission procedure used, and require use of an estimation procedure that the Department determines is more accurate.”

This section then provides a hierarchy, from the most favorable approach to the least favorable, for estimating emissions as follows:

- (a) Using specification Continuous Emissions Monitoring Systems (CEMS) that are required by license conditions or are otherwise available;
- (b) Representative, facility-specific emission testing (required by a license or that is otherwise available) and actual fuel consumption data;
- (c) EPA-published emission factors, where available, and actual fuel consumption data (process rate);
- (d) Emissions factors from other industry and trade groups based on sound science, where available; and actual fuel consumption (process rate) data; or

(e) As a last resort, estimations based on best engineering judgment.

Of course, common sense must also be applied. The bottom line is that the Maine DEP is interested in the most accurate emission estimates that are possible given the resources that are available.

**EPA Published Emission Factors:** EPA has recently published all of the emission factors that it recommends for inventory purposes, in an online database known as Web FIRE, located at <http://cfpub.epa.gov/oarweb/index.cfm?action=fire.main> . This “Internet version of FIRE” is described by EPA as:

“The Factor Information Retrieval (FIRE) Data System is a database containing both rated and unrated emissions factors. FIRE contains 17,130 AP-42-rated factors, as well as approximately 4,400 unrated emissions factors that EPA recommends for use. FIRE also contains a list for source classification codes, and information about industries' operating systems, processes, and chemicals emitted. FIRE incorporates new or revised emission factors from AP-42.”

In FIRE, emission factors are applicable to certain source classification codes (SCCs). Maine’s Satellite i-STEPS database<sup>1</sup> has been pre-loaded with the combustion HAP emission factors that are directly applicable. If a facility chooses to use the preloaded emission factors (Emission Estimation Method Code 8 – i-STEPS Calculated/AP-42), then the HAP emissions will be calculated for the facility once the annual fuel consumption (process rate) is entered on the process unit screen.

However, for certain SCCs, only a limited amount of combustion HAPs have been populated by FIRE and AP-42. In those cases when there are no emission factors that are directly applicable to the SCC code from either the FIRE database, or industry derived emission factors, the Maine DEP has developed “backfilling” emission factors that should be used. These factors are available on the Maine DEP website at <http://www.maine.gov/dep/air/emissions/2005.htm>.

**Trade Organization Emission Factors:** Chapter 137 was constructed with the assumption that the emission factors from the FIRE database that are applicable to specific SCCs are more accurate than the emission factors published by trade organizations. However, the uncertainty of the emission factors in FIRE vary widely, and in some cases a trade organization’s emission factor is going to provide a more accurate estimate of emissions. In other cases, an emission factor may only be available from a trade organization. In these cases, **the facility should use the factor that it believes is the most accurate, based on its professional technical evaluation.** The reference for the emission factor must be cited in the emission calculations that

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<sup>1</sup> Satellite i-STEPS program is used by the Emissions Inventory Program to collect data on criteria pollutant emissions. The software was revised in 2006 to enable the reporting of hazardous air pollutants and greenhouse gases as well. Satellite i-STEPS is an automated tool for storing, reporting, and managing air emissions data. i-STEPS assists with the electronic submission of air emissions data from facilities, and in turn, the transmittal of that data to U.S. EPA. Information on obtaining and using the software is available on the Maine DEP website at: <http://www.maine.gov/dep/air/emissions/isteps.htm>.

are supplied to the DEP. If a facility uses Satellite i-STEPS to calculate its emissions, the trade organization's emission factor would be entered with an Emission Estimation Method Code 9 – i-STEPS Calculated/Local Factor, and the reference for the emission factor would be input into the Note field.<sup>2</sup>

**Backfilling Emission Factors:** In some cases, for a given SCC, the FIRE database or a trade organization has not published a specific emission factor for all HAPs. However, certain HAPs are likely to be formed by the combustion of fuel in that facility. In order to provide a complete inventory, emission factors should be “backfilled”. That is, emission factors applicable to processes with a different SCC, but burning similar fuels in the most similar manner, should be used. **While “backfilling” increases the uncertainty of the emission estimates, these emission estimates will be more accurate than assuming zero emissions.**

The Maine DEP has developed emission factors, by fuel type, that can be used to backfill combustion HAP emission factors, where none were available in FIRE. These supplemental emission factors are based on emission factors published in the FIRE database for similar SCCs. Presented in Excel spreadsheets, these tables also include an estimate of the amount of fuel that a facility will need to burn before it is likely to be required to report combustion HAPs. Finally, the spreadsheets contain examples of fuel types and SCCs found at Maine facilities and for which this guidance was developed.

**Table 1: Hazardous Air Pollutant Emission Factor Spreadsheets That Explain the Basis for Backfilling Emission Factors, located at <http://www.maine.gov/dep/air/emissions/2005.htm>.**

Combustion Material/ Fuel Burned	File Name	Comments
Wood, bark, short paper fiber, sawdust, and similar fuels	<a href="#">HAP EF wood v3.xls</a>	Emissions will vary with the heat value of the fuel. This spreadsheet allows a facility to adjust the emission factors based on its annual average Higher Heating Value, in lbs/BTU.
Residual oil, No. 6 fuel oil, No. 5 fuel oil, waste oil, and similar fuels	<a href="#">HAP EF Residual v1.xls</a>	
Distillate oil, No. 2 fuel oil, No. 3 fuel oil, No. 4 fuel oil, and similar fuels	<a href="#">HAP EF Distillate v1.xls</a>	

If you have any questions or comments on this guidance memo, please contact me at [David.W.Wright@maine.gov](mailto:David.W.Wright@maine.gov) or by telephone at (207)287-6104.

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<sup>2</sup> Further information on entering HAP data into the i-STEPS software is available at <http://www.maine.gov/dep/air/emissions/isteps.htm>